seventeenth century to the present day. In the second essay the relations that should exist between the State and biology are considered, and there can be little doubt but that as a result of this address to the Biological Section of the British Association at Southport, followed by the fifth essay, which gives an outline of the scientific results of the International Fisheries Exhibition, held in London in the same year (1883), we are in great measure indebted for the valuable help given by our Government towards the establishment of the Laboratory at Plymouth belonging to the Marine Biological Association of the United Kingdom.

The third and sixth essays, on Pasteur and hydrophobia—or rabies, as we would prefer to call this formidable disease—and on centenarism, are full of interest, and while in the former the author has to content himself with a narration of the chief results of Pasteur's invaluable labours, in the latter we find an account of a subject which has been critically worked out by himself.

Three of the essays relate to the subject of Darwinism, and possibly will be found the most interesting in the volume. The first is on the subject of "Degeneration, a chapter in Darwinism," and was delivered as one of the evening lectures at the British Association meeting at Sheffield, in 1879. In it Prof. Lankester calls attention to the fact that degeneration, or the simplification of the general structure of an animal, may be due to the ancestors of that animal having taken to one of two habits of life, either the parasitic or the immobile. Other new habits of life appear also to be such as to lead to degeneration. Let us suppose, for example, a race of animals fitted and accustomed to catch their food, and having a variety of organs to help them in this chase; suppose such animals suddenly to acquire the power of feeding on the carbonic acid dissolved in the water around them, just as green plants have. This would lead to degeneration; for they would soon cease to hunt their food, and would bask in the sunlight, taking food in by the whole surface, as plants do by their leaves. Another possible cause of degeneration appears to be the indirect one of minute size. And so, as is well shown, this hypothesis of degeneration enables very numerous cases of animal structure to be accounted for. The second of this set, forming the seventh of the collected series, is on parthenogenesis, and in it we find the fascinating accounts given to us by the painstaking zeal of von Siebold of the habits and manners of the little wasps belonging to the genus Polistes—a story both wonderful and romantic. The third of these, the eighth of the whole set, treats of Haeckel's theory of heredity, in which the transmission of acquired characters by heredity is discussed, but this phase of belief Prof. Lankester will no longer insist upon, and he points out that Weismann's essays on this question should be carefully studied by naturalists.

The last essay to be alluded to is the fourth, on examinations. The author claims that but few have had a wider or a more continuous experience in examinations than he has had. On this somewhat vexed question he has a good deal that is to the point to say, showing that the use of examinations in schools and Universities is different from their use as a test of fitness for entrance into a profession, or a post in the Home or Indian Civil Service, or as a means of deciding a question of relative merit.

We feel sure that as each of these essays originated in a desire to promote the interests of science, so the author, in collecting the present series, will be found to have had the same aim in view.

OUR BOOK SHELF.

Agenda du Chimiste. Par MM. Salet, Girard, et Pabst. (Paris: Hachette and Co., 1890.)

IN this volume will be found a most complete and exhaustive compilation of facts and numerical tables of use to the chemist. The first edition was published in 1877 by M. Wurtz, and in subsequent editions the work has been thoroughly brought up to date. It is now published annually as a chemical year-book, the publication of each year containing a few special articles called for by the events of the past twelve months. This year the following are among the special articles contributed: "The Progress of the Industry of Colouring Matters," "Review of the Exhibition of 1889" as regards matters of chemical interest, and "Views of the International Chemical Congress concerning Nomenclature." The numerical data included in the book are most full, and ought to be of great service in the reduction of observations. The collection of them represents an immense amount of labour, and the accompanying descriptions of experimental methods are very clear and concise. A most useful portion of the work is that in which all the known physical constants of the elements and numerous compounds are given. Special care appears to have been taken in collecting the published thermo-chemical data, with the result that the chapter upon this subject is one of the most valuable in the book. The tables for use in quantitative analysis, and especially those referring to commercial methods, will doubtless be fully appreciated for the saving of time and arithmetical labour which their use will effect. It is, moreover, of no mean advantage that all formulæ are given according to the ordinary nomenclature, and not according to the old notation still retained by many French chemists. The volume is small and handy in spite of its five hundred pages, and cannot fail to be of service in the laboratory. A. E. T.

The Philosophy of Clothing. By W. Mattieu Williams. (London: Thomas Laurie, 1890.)

MR. WILLIAMS is a somewhat eccentric writer, and by most people some of the notions set forth in this little book will be regarded as "fads." He is generally able, however, to give a good reason for the opinions he advances, and much of his advice, although opposed to the rules of fashion, is sound and practicable. The subject is one which occupied the close attention of Count Rumford; and of his researches Mr. Williams, as he himself says, has made "free use."

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The Zoological Affinities of *Heliopora cerulea*, Bl.

THE remarkable blue coral, *Heliopora cerulea*, of Blainville, represents, I believe, one of those species that, in common with *Stylaster*, *Millepora*, and other allied genera, have been recently relegated to the Hydrozoic subdivision of the Cœlenterata. So far as I remember, however, and without having present access

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to the most recent literature of this subject, *Heliopora* was thus transferred with reference to the structure of its corallum only, the living animal having been but imperfectly if at all observed.

In the course of my professional investigations of the fisheries of Torres Straits I have on several occasions obtained specimens of *Heliopora*, but had hitherto been unsuccessful in observing the living animal. Last year I obtained this coral on the Warrior Reef near New Guinea, but while apparently living when collected, and kept for days on board ship with the water continually changed, the zooids refused to make their appearance. Through the courtesy of Captain Dawson, R.N., and the officers of H.M.S. *Rambler*, I have this season journeyed north in that ship, and was afforded the opportunity of conducting a series of investigations in the neighbourhood of the Adolphus Islands, off Cape York, close to the scene of the recent *Quetta* wreck, and with relation to which the *Rambler* had been told off to make a careful survey.

At low spring-tide on the reef adjacent to the "Mid-Brother" rock, I came across a luxuriant growth of *Heliopora*, and was fortunate on this occasion to accurately determine the nature of the fabricators of this remarkable coral. The first living manifestations presented, and those visible only with the aid of a pocket lens, were the protrusion of a transparent body and two elongate tentacles from the numerous circular pores with which the corallum is studded. At first sight some near affinity of the animal to the bitentaculate Hydrozoon *Lar sabellarum* of Gosse was suspected. The movements of the zooids during extension and retraction were, however, more active than those which usually obtain among the Cœlenterata, and together with their general aspect and comportment suggested a nearer relation to the Annelida. This last-named section of the Invertebrata was found on a closer examination to represent their actual position in the zoological scale. On splitting one of the smaller flattened branches of the coral perpendicularly and parallel with its wider axis, I found that the entire coronid system was exposed to view. The little annelid fabricators, having an average length of one-fifteenth of an inch, wriggled into the water in every direction, a large number at the same time remaining passively in the tubular chambers which they originally constructed.

The most prominent external characters of the annelid of *Heliopora cerulea* consist of the bitentaculate head and six pairs of lappet-like branchiæ, which originate in segmental pairs on the dorsal surface and commence about the sixth segment posteriorly from the head. Fine isolated or paired setæ are developed in duplicate on the majority of the residual segments, and two brush-like fasciculi of closely adpressed setæ are conspicuous on the dorsal aspect of the penultimate and antipenultimate caudal segments. On my return to Brisbane a few weeks hence, I purpose preparing and remitting a more detailed account, with illustrations, of the organization of *Heliopora*. In the interim it has occurred to me that this brief announcement of its nature may prove of interest to many of your readers, more especially as it may assist in throwing fuller light on the affinities of the many fossil genera that have hitherto been affiliated with this type among the Cœlenterata, but which in common with *Heliopora* should probably find their true position among the more highly organized section of the Tubicolous Annelida.

W. SAVILLE-KENT,
Commissioner of Fisheries, Queensland.

Thursday Island, Torres Straits, June 18.

Chambers's "Hand-book of Astronomy."

As the writer of the article on "Spectroscopic Astronomy" in the above work, I should like to be permitted to comment upon two points wherein your reviewer has, though doubtless inadvertently, scarcely done me justice.

On p. 292 (NATURE of July 24) the reviewer says that I have "*selected* certain determinations and arranged them in parallel columns to demonstrate the efficiency of the method adopted." The reference is to the comparison which I gave of the results obtained by Dr. Huggins, Mr. Seabroke, and at Greenwich, for motions of stars in the line of sight. But I made no selection. I took *all* the stars that had been observed at two or more of these Observatories, and gave the mean of *all* the observations of each star. I might further add that I think your reviewer is scarcely fair in his description of the discordances of my observations: expressed in wave-length, the average difference from the mean is but a small fraction of a tenth metre. But this is an unimportant matter compared with the suggestion that I have published a "selected"—that is, a "cooked"—comparison.

Then your reviewer complains that I make no reference to Prof. Vogel's observations of Algol, whilst I give my own "later division" of my observations into groups. I made no reference to Prof. Vogel's observations, because they were not published until some considerable time after the final revise of my article had been passed for press; whilst, so far from my division of my observations into groups being later than Prof. Vogel's work, it was two full years earlier, having been communicated to the Royal Astronomical Society in January, 1888, by the Astronomer-Royal (see *The Observatory*, vol. xi. p. 109). I also gave my results in one of the Gresham Lectures, Easter, 1888.

E. W. MAUNDER.

Royal Observatory, Greenwich, S.E., August 1.

I REGRET that my words allowed the interpretation which Mr. Maunder points out, for I had no intention of insinuating that the comparisons were "cooked." What I take exception to is that, according to the values given, γ Cassiopeiæ has a motion in the line of sight of -12, although on February 19, 1887, Mr. Maunder determined it as $-54{\cdot}2$, and eight minutes afterwards as $+60{\cdot}9$; and again, β Pegasi is stated to have a motion in the line of sight of -8, although in November 1881 two determinations, made within ten minutes of each other, differed by nearly 114 miles per second. It would seem, therefore, that in making a tabular statement, even of the mean of such values found by different observers, the magnitude of the probable error should be mentioned; for, as I remarked at the time, "To one unacquainted with instrumental difficulties, the motion of stars in the line of sight would appear to be a quantity that may be determined with some accuracy," whereas this is not the case. I have no intention of questioning Mr. Maunder's skill as an observer, but the fact that the discordances, when expressed in wave-lengths, are very small, only supports my contention that, until more perfect instrumental conditions are possible, many of the values are useless, and their determination an affectation of accuracy.

Mr. Maunder has himself to blame for my want of information with respect to Algol. He gives no reference to the report of the remarks made by the Astronomer-Royal in January 1888, and his own comments, at the meeting of December 1889, upon Prof. Vogel's work, led me to suppose nothing had been done previously.

THE REVIEWER.

Gregory's Series.

GREGORY'S series, on which are founded nearly all the methods of obtaining the approximate value of π, is made to depend, in works on trigonometry, on De Moivre's theorem and results flowing from it.

The following does not require the use of $\sqrt{-1}$, but depends only on two things—that the circular measure of an angle and its tangent are practically equal when the angle is indefinitely small, and that $\tan(A-B) = \dfrac{\tan A - \tan B}{1 + \tan A \,.\, \tan B}$.

Let

$$\tan\theta \equiv \tan(a_0 + a_1x + a_2x^2 + \&c.) = x;$$

$$\therefore \tan\{a_0 + a_1(x+h) + a_2(x+h)^2 + \&c.\} = x + h;$$

$$\therefore \tan h \,.\, \{a_1 + 2a_2x + 3a_3x^2 + \&c. + \text{terms involving } h, \text{ say } H\} = \frac{h}{1 + x(x+h)};$$

$$\therefore \frac{\tan h\{a_1 + 2a_2x + 3a_3x^2 + \&c. + H\}}{h(a_1 + 2a_2x + 3a_3x^2 + \&c. + H)} = \frac{1}{\{1 + x(x+h)\} \,.\, (a_1 + 2a_2x + 3a_3x^2 + \&c. + H)}.$$

Let $h = 0$;

$$\therefore 1 = \frac{1}{(1+x^2) \,.\, (a_1 + 2a_2x + 3a_3x^2 + \&c.)}.$$

Equating coefficients of like powers of x,

$$a_1 = 1,\ a_2 = 0,\ a_3 = -\tfrac{1}{3},\ \&c.;$$

$$\therefore \theta = a_0 + x - \tfrac{1}{3}x^3 + \&c.,$$

where evidently $a_0 = 0$, or a multiple of π.

Taking $\theta = \dfrac{\pi}{4}$,

$$\frac{\pi}{4} = 1 - \tfrac{1}{3} + \tfrac{1}{5} - \tfrac{1}{7} + \&c.$$

R. CHARTRES.

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